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state that "all questions connected with the relation between true self-fertility and self-sterility have been omitted designedly as pertaining to a distinct problem." Are we unreasonable in asking for a single theory to explain both self-fertility and self-sterility? Are we wrong in thinking that the significance of self-sterility lies in its relation to self-fertility? Such a general theory, no doubt, will be provided by the authors in their later reports; the present publication evidently represents merely the first of a series on the general subject of self-sterility.

The explanation also has another theoretical shortcoming, similar to that which applied to EAST's "heterozygosis." In heterozygosis EAST stated that hybrids are vigorous because of their heterozygous sets. This virtually amounted to saying that hybrids are vigorous because they are hybrids. "Heterozygosis" was a more accurate and scientific statement of the fact of hybrid vigor, but it was not an explanation. Now EAST states that pollen will not function on stigmas of a plant of which the germinal constitution is the same as that of the plant which produced the pollen. Couched in a terminology involving multiple allelomorphs and crossing over, this may well be a more accurate and scientific statement of the facts of self-sterility and its behavior in inheritance, but it is not an explanation. Such scientific restatements are very valuable in helping to organize facts, and "heterozygosis" unquestionably had such a value. The present theory, however, seems at first sight a much less valuable one, since it is so elastic as to be confusing.

But whether the theoretical argument of the authors is destined to stand or fall, they have done an exemplary piece of research. This seems to have been the first satisfactory experimental attack upon the problem of self-sterility, and the resulting data are therefore extremely valuable.—MERLE C. COULTER.

Buffer processes in succulents.—JENNY HEMPEL⁴ has made a very important addition to our rather limited knowledge of actual reaction in plants. Succulents were used in this work, since, with their well known wide and rapid variations in acid content, they might be expected to supply especially interesting material for such a study. Determinations by the use of the hydrogen electrode were made on the juices of numerous specimens of the plants studied, after they had been exposed to varying conditions. The values found range from $P_H = 3.9$ to $P_H = 5.7$. Higher acidity than the more acid of these values is recorded in the same work in lemon juice ($P_H = 2.19$); and by HAAS⁵ in citrus fruits ($P_H = 2.22-3.8$), in cranberries ($P_H = 2.4$), and by a less exact method⁶ in the petals of certain flowers ($P_H =$ about 3).

⁴ HEMPEL, JENNY, Buffer processes in the metabolism of succulent plants. *Compt. Rend. Trav. Lab. Carlsberg* 13:1-129. 1917.

⁵ HAAS, A. R. The reaction of plant protoplasm. *BOT. GAZ.* 63:232-235. 1917.

⁶ ———, The acidity of plant cells as shown by natural indicators. *Jour. Biol. Chem.* 27:233-241. 1916.

It would seem that such marked changes as were found in the reaction of the juices of active tissue must affect considerably the metabolic processes, as well as the physical condition of the tissue. CROCKER⁷ has suggested that these changes may be important in the regulation of transpiration by succulents. The lower values are of the same order as those reported in the same work by HEMPEL and also quoted from WAGNER for non-succulent plants. Such P_H values range from 5.4 to somewhat above 6. Slightly alkaline juices are reported by HAAS (*loc cit.*) in the petals of certain flowers; he finds, however, that blue pigments by no means always indicate an alkaline reaction.

As the title suggests, the principal object of the work was to gain some information as to the substances in the plant juices which act as buffers, or regulators of their reaction. On the acid side of the neutral point the following data were obtained for this study: (1) titration to the litmus end point ($P_H = 6.8$) compared with the original P_H value; (2) qualitative tests to determine the organic and inorganic acid radicals present; (3) ash analyses to determine the total base present; (4) studies of the reaction and titration values of malic acid salts, and such mixtures of them as appear likely to occur in the plant. The data are most complete for the juices of *Rochea falcata*, *Cotyledon obovata*, and *C. linguaefolia*. The conclusion is reached that in these plants, and probably in all succulents, the concentration of hydrogen ions is determined by the relation between the quantities of acid and normal malate present.

On the alkaline side of the litmus end point the data may be grouped as follows: (1) titration from the litmus end point to that of phenolphthalein ($P_H =$ about 9.2); (2) determination of nitrogen and in some cases phosphorus; (3) titration experiments with aluminum malate; (4) titration experiments with unknown and variable substances precipitated at the phenolphthalein point. It is concluded that aluminum malate and the unknown substances mentioned are the principal buffers in this region. The nitrogen and phosphorous compounds have very little effect. The titration to the phenolphthalein end point is admitted to be very unreliable. It seems unfortunate that as considerable quantities of the juice were available the electrometric method of titration was not used. Such results would have contributed much to the completeness and accuracy of the data.—THOMAS G. PHILLIPS.

Mutationists and selectionists.—JENNINGS⁸ has attempted to reconcile the views of the "mutationists" and the "selectionists." The latter, headed by CASTLE, have claimed that selection can modify unit characters, and have presented striking evidence on the point. The mutationists have then demonstrated that these data may also be interpreted by assuming that there is but

⁷ CROCKER, WM., Rev. BOT. GAZ. 64:526-527. 1917.

⁸ JENNINGS, H. S., Modifying factors and multiple allelomorphs in relation to the results of selection. Amer. Nat. 51:301-306. 1917.

———, Observed changes in hereditary characters in relation to evolution. Jour. Wash. Acad. Sci. 7:281-301. 1917.